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URQUHART-DYKES & LORD

12 Name and daytime telephone number of person to contact in the United Kingdom — Martin Vinsome - 0191 2618573

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SYRINGE

The present invention relates to syringes, and relates particularly, but not exclusively, to disposable syringes for administering medical injections to patients, or withdrawal of bodily fluids such as blood.

Disposable syringes are known in which a cylindrical barrel formed of transparent plastics material receives a piston which is slidable within the barrel. A generally cruciform shaft extends from the piston to a plunger handle for enabling the piston to be displaced along the barrel in a first direction to cause injectable fluid to be injected into a patient to be drawn into the barrel via an aperture at one end of the barrel, or in a second direction to cause the fluid to be expelled out of the aperture to be injected into a patient via a needle.

Syringes of this type are generally sold as disposable items and are intended to only be used once to negate the risk of transmission of diseases between patients. However, such syringes suffer from the drawback that it is difficult to prevent such syringes from being re-used, which re-use increases the risk of transmission of serious, life-threatening, conditions such as certain bacterial infections, viral hepatitis, and HIV.

Preferred embodiments of the present invention seek to overcome the above disadvantages of the prior art.

According to the present invention, there is provided a syringe comprising:-

a barrel for containing fluid and having at least one aperture adjacent a first end thereof;

a piston having at least one shaft extending therefrom and adapted to be displaced in said barrel in a first direction from a first position to a second position to cause fluid to enter the barrel through at least one said aperture, and in a second direction from said second position to a third position to cause fluid to be expelled through at least one said aperture;

at least one slider member mounted between at least one said shaft and said barrel for sliding movement relative to said barrel and the corresponding said shaft;

at least one first gripping member acting between a respective said slider member and a respective said shaft for sliding movement relative to said shaft, wherein at least one said first gripping member has a greater resistance to sliding movement relative to the corresponding shaft in said first direction than in said second direction, such that movement of said piston from said second position to said third position causes at least one said slider member to move along said barrel in said second direction; and

at least one second gripping member acting between a respective said slider member and said barrel to cause the corresponding said slider member to have a greater resistance to sliding movement relative to the barrel in said first direction than in said second direction, such that movement of the piston from said third position to said second position, subsequently to movement of said piston from said second position to said third position, without damaging said syringe, is prevented.

By providing a syringe in which movement of the piston from said third position to said second position subsequently to movement of said piston from said second position to said third position is prevented, this provides the advantage of preventing re-filling of the syringe after the piston has been displaced from

the second position to the third position to expel fluid out of the barrel. In other words, the syringe is prevented from being re-used after it has been used to administer an injection or remove bodily fluids, as a result of which the risk of transmission of disease is significantly reduced.

In a preferred embodiment, the first position is substantially coincident with the third position.

At least one said second gripping device may be adapted to engage said barrel such that movement of the corresponding said slider member in said first direction relative to the barrel causes damage to the surface of said barrel to prevent said piston subsequently forming a fluid seal with said barrel.

This provides the advantage that forced withdrawal of the piston subsequently to movement of the piston from the second to the third position causes damage to the smooth walls of the barrel, thereby destroying the integrity of the fluid seal between the piston and the barrel. As a result, the syringe can no longer generate the necessary suction to be filled with fluid or pressure to expel fluid. This in turn makes re-use of the syringe more difficult.

At least one said first gripping member and the corresponding slider member may be adapted to cooperate to allow limited sliding movement of said piston relative to the barrel in said first direction subsequently to movement of said piston from said second position to said third position.

This provides the advantage of enabling slight withdrawal of the piston during use to determine whether a needle connected to the syringe has been inserted into a blood vessel. For example, an intramuscular injection, to be injected into muscle tissue, should not be injected into a blood vessel, and slight withdrawal

of the piston causes a visible amount of blood to be drawn into the barrel if the needle of the syringe has punctured a blood vessel. However, this safety feature will not permit a significant amount of injectable material to be subsequently withdrawn into the syringe after the primary injection has occurred.

At least one first gripping member and the corresponding slider member may surround the corresponding shaft, wherein the gripping member is adapted to move relative to the corresponding slider member between first and second stop positions.

At least one said first and/or second gripping member may comprise at least one metal tine.

At least one first and/or second gripping member may comprise elastomeric material.

An inner wall of the barrel may comprise a first plastics material, and at least one second gripping member may comprise a second plastics material harder than said first material.

An outer wall of at least one said shaft may comprise a third plastics material, and at least one corresponding said first gripping member may comprise a fourth plastics material harder than said third material.

A preferred embodiment of the invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings, in which:-

Figure 1a is a cross-sectional side view of a syringe embodying the present invention in an initial manufacturer's packaging position;

Figure 1b is a view, corresponding to Figure 1a, of the syringe of Figure 1a with the piston thereof withdrawn to enable filling of the barrel;

Figure 1c is a view, corresponding to Figure 1a, of the syringe of Figure 1a with the piston thereof depressed to eject liquid from the barrel; and

Figure 2 is detailed cross-sectional side view of a slider member of the syringe of Figure 1 in the positions shown in Figures 1a and 1b.

Referring to Figures 1 and 2, a syringe 2 has a barrel 4 of transparent plastics material having an open end 6 having a widened rim 8 defining an indentation 10 of reduced diameter. The barrel 4 also has an outlet 12 having a needle (not shown) at the end thereof opposite from the open end 6 of the barrel 4.

A piston 14 is slidably received within barrel 4 and has a shaft 16 of plastics material extending from it and having a plunger handle 18 snap-fitted on the end thereof opposite to the piston 14. A slider member in the form of a safety bobbin 20 of plastics material is slidably received within the barrel 4 and surrounds shaft 16. A gripping washer 22 surrounds the shaft 16 and has tines 24 of metal or plastics material harder than the plastic material of shaft 16 such that the washer 22 grips the shaft 16 and can slide in the direction of arrow A relative to the shaft 16 but cannot slide in the direction of arrow B (Figure 1a).

A second gripping member in the form of a plurality of tines 26 of metal or harder plastics material than the plastics material of inner wall of barrel 4 surrounds safety bobbin 20 such that tines 26 engage the inner wall of barrel 4 in a manner such that the safety bobbin 20 can be moved relative to the barrel 4 in the direction of arrow A but cannot be moved in the direction of

arrow B. The washer 22 can slide a limited distance d (Figure 2) in either direction relative to the safety bobbin 20 between end walls 28, 30 of safety bobbin 20.

In order to assemble the syringe 2, the piston 14 together with the shaft 16, with the plunger handle 18 removed from the shaft 16, is inserted into the barrel 4 and pushed along the barrel until it abuts the end of the barrel adjacent to outlet 12. The safety bobbin 20, together with washer 22 and gripping member 26 is then placed around the shaft 16 and snap-fitted into the open end 6 of barrel 4. The safety bobbin 20 is prevented by indentation 10 and gripping member 26 from being removed from the barrel 4. The plunger handle 18 is then snap fit onto the end of shaft 16 remote from piston 14.

The operation of the syringe 2 will now be described.

The syringe 2 is provided by the manufacturer in sterile packaging (not shown) in the condition shown in Figure 1a but with the plunger handle 18 mounted to the shaft 16. In order to fill the syringe 2, the needle (not shown) extending from outlet 12 is inserted into a reservoir of injectable liquid, or into the body of a patient, as a result of which liquid is drawn into the barrel 4 through outlet 12. The plunger handle 18 is then withdrawn in the direction of arrow B (Figure 1a) to withdraw the piston 14 until it abuts the safety bobbin 20 as shown in Figure 1b. In this position, the safety bobbin 20 is captured and locked in the barrel 4, and shaft 16 slides in the direction of arrow B relative to safety bobbin 20 and washer 22 until the piston 14 abuts end wall 30 of safety bobbin 20. At the same time, the washer abuts end wall 28 of safety bobbin 20.

In order to administer an injection, or expel bodily fluid such as blood from the syringe 2, the plunger handle 18 is then pushed in the direction of arrow A, as a result of which the piston 14

moves towards outlet 12 to expel liquid from the outlet 12. At the same time, because of the axial length of safety bobbin 20, rocking of the piston 14 and shaft 16 relative to safety bobbin 20 and barrel 4 is prevented. The washer 22 is prevented from moving in the direction of arrow B relative to shaft 16, but can move distance d relative to safety bobbin 20 until it abuts end wall 30 of safety bobbin 20. Thereafter, as the piston 14 moves in the direction of arrow A and barrel 4, the safety bobbin 20 moves along barrel 4 until the piston 14 abuts the end wall of barrel 4 adjacent outlet 12 as shown in Figure 1c.

If the piston handle 18 is at any point withdrawn in the direction of arrow B, the washer 22 can move distance d within safety bobbin 20 until piston 14 abuts end wall 30 of safety bobbin 20, or the washer 22 abuts the end wall 28 of safety bobbin 20. If the needle extending from outlet 12 has been inserted into a blood vessel, this action will withdraw blood into the barrel 4, which can then be seen by a user.

At the end of travel of the piston 14 and after the washer 22 abuts end wall 30 (or piston 14 abuts end wall 30) of safety bobbin 20, subsequent movement of the piston 14 in the direction of arrow B is limited only to the small float distance d, large functional movement is prevented by engagement of the gripping member 26 with the internal wall of barrel 4. If sufficient force is applied to the shaft 16 to overcome the resistance of gripping member 26, one or more, or even all, of the tines of gripping member 26 will damage the internal wall of barrel 4 of the syringe 2, resulting in an effective fluid seal between the piston 14 and the inner wall of the barrel 4 no longer being possible. In this way, withdrawal of piston 14 will no longer cause suction in barrel 4, as a result of which the syringe cannot be re-filled with injectable liquid and therefore cannot be re-used.

It will be appreciated by persons skilled in the art that the above embodiment has been described by way of example only, and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims.

CLAIMS

1. A syringe comprising:-

a barrel for containing fluid and having at least one aperture adjacent a first end thereof;

a piston having at least one shaft extending therefrom and adapted to be displaced in said barrel in a first direction from a first position to a second position to cause fluid to enter the barrel through at least one said aperture, and in a second direction from said second position to a third position to cause fluid to be expelled through at least one said aperture;

at least one slider member mounted between at least one said shaft and said barrel for sliding movement relative to said barrel and the corresponding said shaft;

at least one first gripping member acting between a respective said slider member and a respective said shaft for sliding movement relative to said shaft, wherein at least one said first gripping member has a greater resistance to sliding movement relative to the corresponding shaft in said first direction than in said second direction, such that movement of said piston from said second position to said third position causes at least one said slider member to move along said barrel in said second direction; and

at least one second gripping member acting between a respective said slider member and said barrel to cause the corresponding said slider member to have a greater resistance to sliding movement relative to the barrel in said first direction than in said second direction, such that movement of the piston from said third position to said second position subsequently to movement

of said piston from said second position to said third position, without damaging said syringe, is prevented.

2. A syringe according to claim 1, wherein the first position is substantially coincident with the third position.

3. A syringe according to claim 1 or 2, wherein at least one said second gripping device is adapted to engage said barrel such that movement of the corresponding said slider member in said first direction relative to the barrel causes damage to the surface of said barrel to prevent said piston subsequently forming a fluid seal with said barrel.

4. A syringe according to any one of the preceding claims, wherein at least one said first gripping member and the corresponding slider member are adapted to cooperate to allow limited sliding movement of said piston relative to the barrel in said first direction subsequently to movement of said piston from said second position to said third position.

5. A syringe according to claim 4, wherein at least one first gripping member and the corresponding slider member surround the corresponding shaft, wherein the gripping member is adapted to move relative to the corresponding slider member between first and second stop positions.

6. A syringe according to any one of the preceding claims, wherein at least one said first and/or second gripping member comprises at least one metal tine.

7. A syringe according to any one of the preceding claims, wherein at least one first and/or second gripping member comprises elastomeric material.

8. A syringe according to any one of the preceding claims, wherein an inner wall of the barrel comprises a first plastics material, and at least one second gripping member comprises a second plastics material harder than said first material.

9. A syringe according to any one of the preceding claims, wherein an outer wall of at least one said shaft comprises a third plastics material, and at least one corresponding said first gripping member comprises a fourth plastics material harder than said third material.

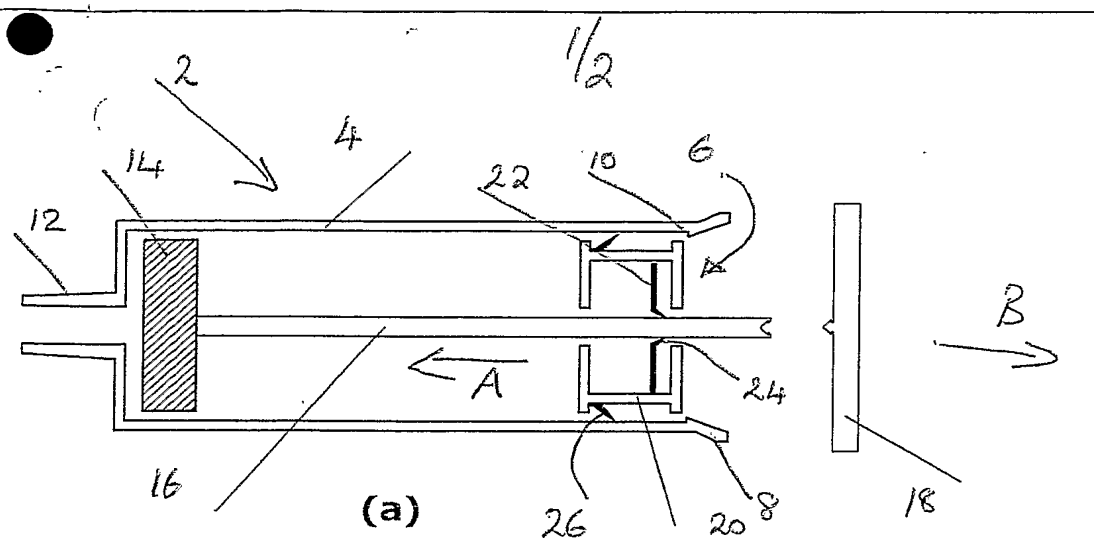
10. A syringe substantially as hereinbefore described with reference to the accompanying drawings.

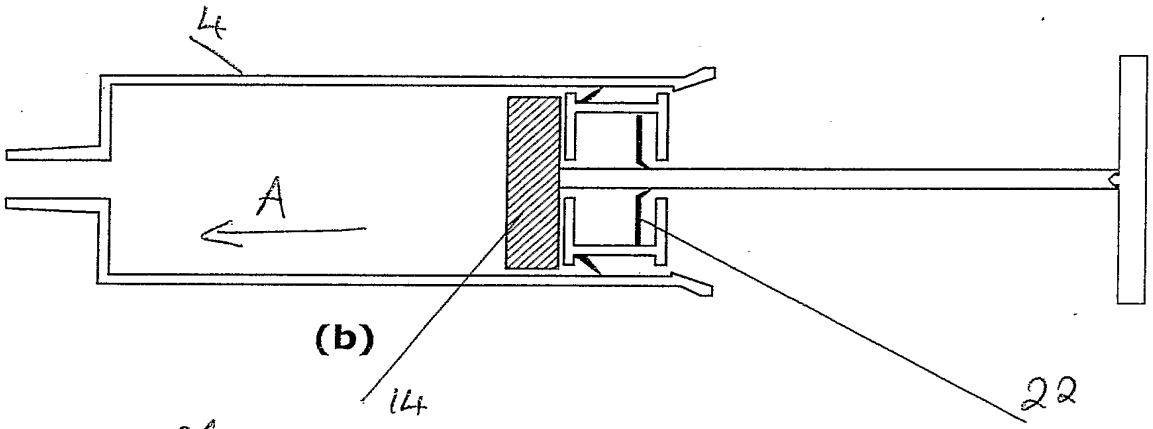
ABSTRACT

SYRINGE

A disposable syringe 2 is disclosed. Withdrawal of a plunger handle 18 in the direction of arrow B to fill the syringe causes a moveable safety bobbin 20 to lock, and shaft 16 slides in the direction of arrow B relative to safety bobbin 20 and washer 22. Subsequent depression of plunger handle 18 in the direction of arrow A causes safety bobbin 20 to move along barrel 4, from which position it can not be withdrawn. This therefore prevents subsequent withdrawal of piston 14 and therefore prevents re-use of the syringe.

[Figure 1a]





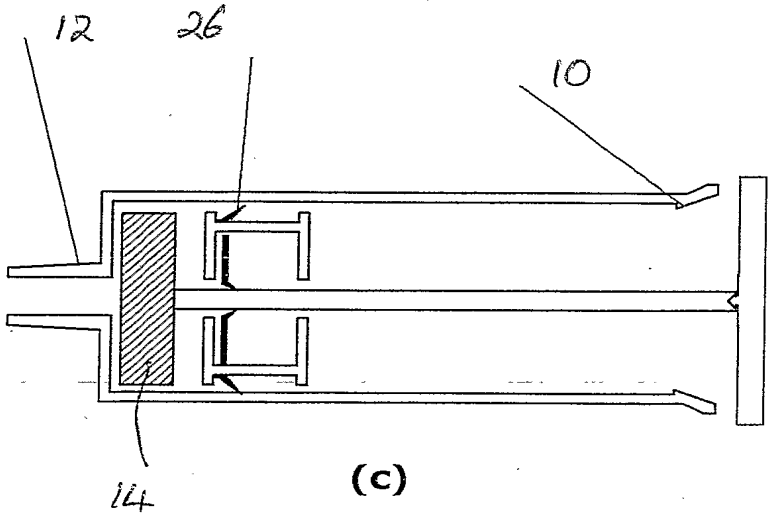


Figure 1

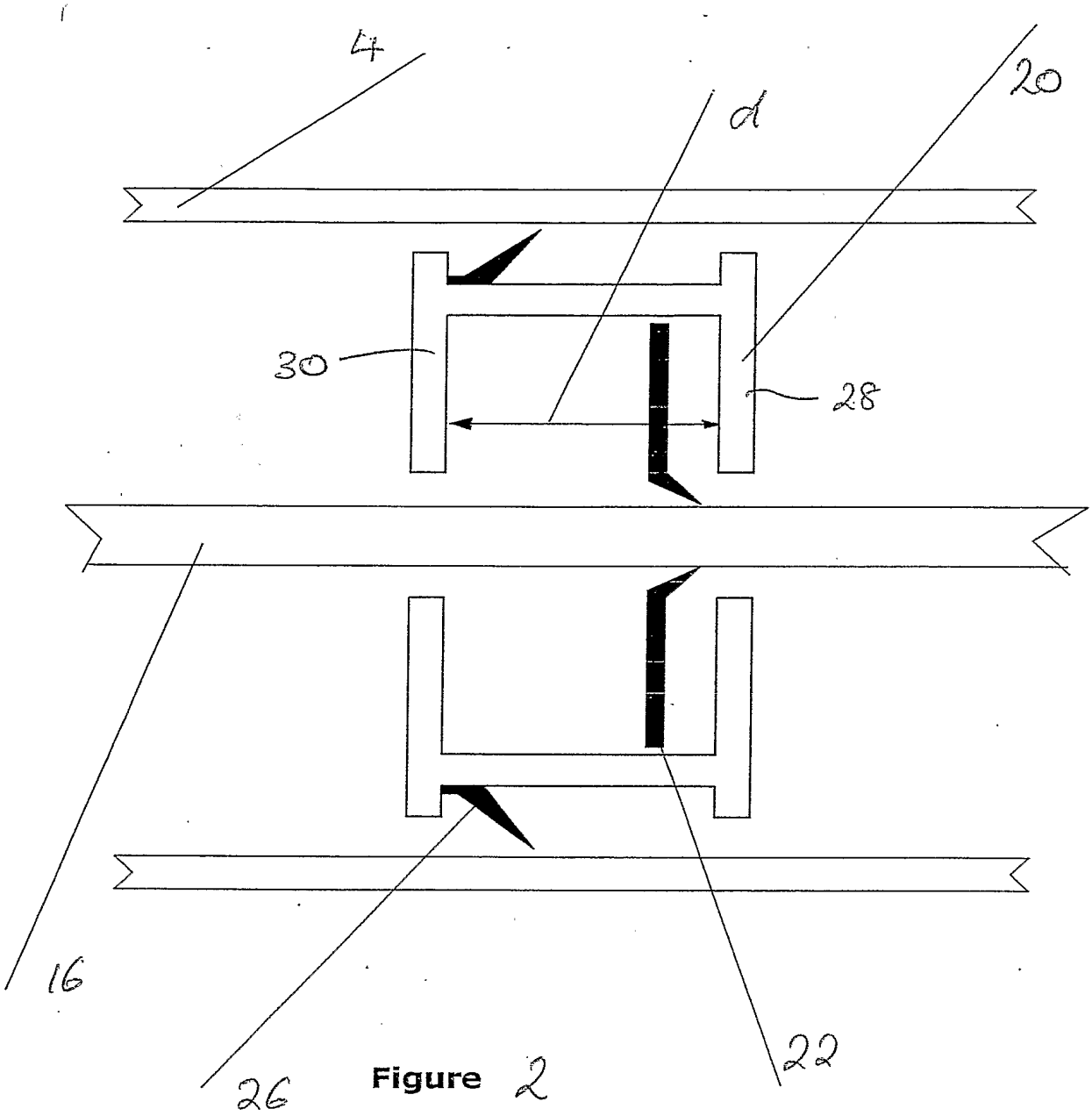


Figure 2